

WHAT IS CLAIMED IS:

Sub 917 1. A model train system comprising:  
a remote control unit that outputs commands;  
a track interface unit that receives the commands; and  
5 a train track layout coupled to the track interface unit;  
wherein the track interface unit converts the commands into a modulated signal  
and outputs the modulated signal to the train track layout.

2. The model train system of claim 1, wherein the modulated signal has a  
10 wide bandwidth.

Sub 927 3. The model train system of claims 1 or 2, wherein the modulated signal is a  
spread spectrum signal.

15 4. A speed control circuit for model trains comprising:  
a motor;  
a motor drive circuit for controlling the motor's speed;  
a speed sensor for sensing a current speed of the model train; and  
a processor coupled to the speed sensor for comparing the current speed  
20 to a desired speed, and for controlling the motor drive circuit so that the motor's speed  
is adjusted to match the desired speed.

5. The speed control circuit of claim 4, wherein the speed of the model train is maintained at substantially the desired speed regardless of changes in the model train's work load.

5 6. A sound system for model trains comprising:  
an external sound source for providing sounds;  
a track interface unit coupled to said external sound source for receiving said sounds; and  
a train track layout coupled to said track interface unit;  
10 wherein the track interface unit converts the sounds into a modulated signal and outputs the modulated signal to the train track layout.

15 7. The sound system of claim 6 further comprising a model train on the train track layout capable of receiving the modulated signal from the train track layout and processing the modulated signal in order to retrieve the sounds and play them through a speaker located on the model train.

20 8. The sound system of claims 6 or 7, wherein the external source is any one of a CD player, cassette tape player, MP3 player, DVD player, mini-disc player, or memory stick.

9. The sound system of claims 6 or 7, wherein the external source is a computer.

10. The sound system of claim 9, wherein the sounds are downloaded from the Internet.

11. The sound system of claim 6, wherein the modulated signal has a wide bandwidth.

12. The sound system of claims 6 or 7, wherein the modulated signal is a spread spectrum signal.

13. The sound system of claims 6 or 7, wherein the external source is a microphone.

14. The sound system of claims 6 or 7, wherein the modulated signal is an FM signal.

15. The sound system of claim 14, wherein the external source is any one of a CD player, cassette tape player, MP3 player, DVD player, mini-disc player, or memory stick.

16. The sound system of claim 14, wherein the external source is a computer.

17. The sound system of claims 14 or 16, wherein the sounds are downloaded from the Internet.

18. An electrically operated model train coupler comprising:  
5 a knuckle assembly movable between an open position and a closed position;  
a movable plunger assembly mechanically couplable to said knuckle assembly,  
wherein said movable plunger assembly includes a cap configured to engage  
10 said knuckle assembly at a locking position of said plunger assembly for locking said knuckle assembly in said closed position;  
a solenoid assembly for driving said movable plunger assembly toward or away from said locking position; and  
a guide member for guiding said cap toward and away from said locking  
15 position.

19. The coupler of claim 18, wherein application of a voltage to the solenoid assembly causes the solenoid assembly to generate a magnetic field which attracts the plunger assembly, thereby causing the plunger assembly to move toward or  
20 away from said locking position.

20. The coupler of claim 19, wherein the applied voltage to the solenoid assembly is less than or equal to approximately 6 volts.

21. A smoke unit for model trains capable of simulating steam or smoke emitting from said train comprising:

a holding unit for holding a smoke-producing substance;

at least one resistor coupled to the holding unit for heating the smoke-producing substance until the smoke-producing substance begins to smoke; and  
a fan for blowing the smoke.

22. The smoke unit of claim 21 wherein the amount of smoke produced is proportional to the amount of heat applied by the resistor.

23. The smoke unit of claim 21 wherein the resistor is heated by application of a voltage thereto, such that the greater the voltage applied, the hotter the resistor becomes.

24. The smoke unit of claim 23 wherein the hotter the resistor becomes, the more smoke is generated.

25. The smoke unit of claims 21, 22, 23, or 24, further comprising an electronic brake on the fan for periodically stopping the fan from blowing the smoke.

26. A model train control system comprising:

a track interface unit;

a remote control unit for communicating with the track interface unit;

a train track layout coupled to the track interface unit; and  
an accessory interface unit coupled to the track interface unit and to one  
or more accessories located on or around the train track layout;

wherein the remote control unit has a memory for storing the identity of one or  
5 more of said accessories, such that a command entered on the remote control unit  
controls said one or more accessories.

27. The model train control system of claim 26, wherein the command is  
received by the track interface unit, which communicates said command to the  
10 accessory interface unit for controlling said one or more accessories.

28. A model train comprising:  
a processor;  
a speed control circuit;  
15 a sound system circuit for playing sounds that simulate real-life train  
operation sounds; and  
a smoke unit for producing smoke from the model train;  
wherein the speed control circuit monitors the speed of the model train and  
provides the speed to the processor, which then controls the sound system circuit and  
20 smoke unit such that the train operation sounds and the smoke correspond to the speed  
of the model train.

29. The model train of claim 28, wherein as the speed of the model train increases, the sound system circuit plays train operation sounds which simulate a train moving at an increased speed, and the smoke unit produces an increased amount of smoke.

5 30. A model train control system for controlling model trains on a train track layout, comprising:

a track interface unit coupled to said train track layout;

a remote control unit for communicating with the track interface unit; and

10 a model train comprising:

a processor;

a speed control circuit;

a sound system circuit; and

a smoke unit;

15 wherein a speed command entered on the remote control unit is communicated to the track interface unit, which passes the command to the model train via rails on the train track layout, the processor in the model train receiving the command and in turn commanding the speed control circuit to drive the model train to a speed indicated in the speed command, the processor further (1) controlling the sound system circuit to play  
20 sounds corresponding to the model train speed, and (2) controlling the smoke unit to produce smoke corresponding to the model train speed.

31. The model train control system of claim 30, wherein as the speed of the model train increases, the sound system circuit plays train operation sounds which simulate a train moving at an increased speed, and the smoke unit produces an increased amount of smoke.

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32. A model train sound recording system comprising:  
a train track layout;  
an external sound source;  
a track interface unit coupled to the external sound source and to the train  
10 track layout; and  
a model train on the train track layout comprising a processor, memory,  
and sound system circuit;  
whereby the track interface unit receives sounds from the external sound source  
and sends the sounds down rails of the train track layout, where the sounds are  
15 received by the model train's processor and stored in the memory for playback through  
the sound system circuit.

20 33. The model train sound recording system of claim 32, wherein the external sound source is any one of a CD player, tape cassette player, mini-disc player, MP3 player, DVD player or memory stick.

34. The model train sound recording system of claim 32, wherein the external sound source is a computer.



35. The model train sound recording system of claim 34, wherein the sounds are downloaded from the Internet.

36. A model train sound recording system comprising:  
5 an external sound source; and  
a track interface unit for receiving sounds from the external sound source and storing the sounds in a memory located in the track interface unit.

37. The model train sound recording system of claim 36, further comprising a  
10 train track layout coupled to the track interface unit and a model train on the train track layout, wherein the sounds stored in the memory are retrieved by a processor in the track interface unit and sent down rails of the train track layout, the sounds being received by the model train and played through a sound system circuit located in the model train.

38. The model train sound recording system of claims 36 or 37, wherein the external sound source is any one of a CD player, tape cassette player, mini-disc player, MP3 player, DVD player or memory stick.

39. The model train sound recording system of claims 36 or 37, wherein the external sound source is a computer.

40. The model train sound recording system of claim 39, wherein the sounds are downloaded from the Internet.

41. A model train sound system comprising:

a train track layout;

a remote control unit that outputs a Doppler effect command;

a track interface unit coupled to said train track layout that receives said Doppler effect command and converts it to a modulated signal which is outputted to said train track layout; and

a model train on said train track layout capable of playing train sounds, said model train picking up said modulated signal from said train track layout and retrieving the Doppler effect command from said modulated signal, such that the model train plays one or more train sounds that simulate the Doppler effect.

42. The model train sound system of claim 41, wherein the Doppler effect simulation is based on a fixed distance travelled by the model train around said train track layout.

43. The model train sound system of claim 42, wherein said fixed distance is set by entering (1) a start Doppler loop command and (2) a stop Doppler loop command on said remote control unit, whereby the distance travelled by the model train on the train track layout during the interval between said start Doppler loop command and said stop Doppler loop command is the fixed distance.

44. A model train system comprising:

- a remote control unit for outputting commands;
- a track interface unit that receives the commands; and
- a train track layout coupled to said track interface unit;

5           whereby (1) the train interface unit processes said commands and outputs the  
commands to the train track layout, and (2) the track interface unit provides an  
acknowledge signal to the remote control unit which indicates that the track interface  
unit successfully received and processed said command.

~~45~~<sup>9</sup>. The model train system of claim ~~44~~<sup>6</sup> further comprising a model train operating on said train track layout, wherein said model train receives said command and outputs an acknowledge signal back to the track interface unit which indicates that the model train successfully received said command.

~~48.~~<sup>10</sup> The model train system of claim ~~45~~<sup>9</sup>, wherein said model train processes and executes said command.

~~47.~~<sup>11</sup> The model train system of claims ~~45~~<sup>9</sup> or ~~46~~<sup>10</sup>, wherein said track interface unit outputs a signal to said remote control unit indicating that the model train successfully received said command.



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54. The model train system of claim 53, whereby said track interface unit  
outputs a command in response to said operating information.

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55. The model train system of claim 53, whereby said operating information is  
5 received by said track interface unit and the track interface unit outputs a signal  
containing said operating information to said remote control unit.

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56. The model train system of claim 44, whereby said acknowledge signal is  
displayed on said remote control unit.

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57. The model train system of claim 47, whereby said signal indicating that the  
model train successfully received said command is displayed on said remote control  
unit.

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58. The model train system of claim 48, whereby said signal indicating that  
said model train successfully executed said command is displayed on said remote  
control unit.

23 15  
59. The model train system of claim 51, whereby said signal containing said  
20 operating information is displayed on said remote control unit.

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60. The model train system of claim 52, whereby said signal containing said  
diagnostic information is displayed on said remote control unit.

61. <sup>25</sup> The model train system of claim <sup>19</sup> 55, whereby said signal containing said operating information is displayed on said remote control unit.

5 62. A sound system for model trains comprising:  
an external sound source for providing sounds;  
a track interface unit coupled to said external sound source for receiving  
said sounds; and  
a train track layout coupled to said track interface unit;  
wherein the track interface unit provides the sounds to the train track layout.

10 63. The sound system of claim 62 further comprising a model train on the train track layout capable of receiving the sounds from the train track layout and playing the sounds through a speaker located on the model train.

15 64. The sound system of claims 62 or 63, wherein the external source is any one of a CD player, cassette tape player, MP3 player, DVD player, mini-disc player, or memory stick.

20 65. The sound system of claims 62 or 63, wherein the external source is a computer.

66. The sound system of claim 65, wherein the sounds are downloaded from the Internet.

67. The sound system of claims 62 or 63, wherein the external source is a microphone.

5 68. A speed control circuit for model trains comprising:  
a motor;  
means for adjusting the motor's speed;  
means for sensing a current speed of the model train; and  
a processor for comparing the current speed to a desired speed and for  
controlling the means for adjusting so that the motor's speed substantially matches the  
10 desired speed.

69. The speed control circuit of claim 69 further comprising means for sensing  
load conditions of the model train, whereby said processor takes the load conditions into  
account when controlling the means for adjusting.

15 70. A model train system comprising:  
a train track layout;  
a track interface unit coupled to said train track layout;  
an information appliance coupled to said track interface unit; and  
20 a model train operating on said train track layout, the model train providing  
operating information to said track interface unit through said train track layout.

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71. The model train system of claim 70, wherein said track interface unit provides said operating information to said information appliance.

72. The model train system of claim 71, wherein said information appliance uploads said operating information to the Internet.

73. The model train system of claims 70, 71, or 72, wherein said information appliance is a computer.

74. The model train system of claim 70, wherein said information appliance downloads information from the Internet and said downloaded information is provided to said model train through said track interface unit and said train track layout.

75. The model train system of claim 74, wherein said information appliance is a computer.

76. A model train comprising:  
a processor;  
a communication circuit;  
a memory;  
a sound system circuit; and  
a smoke system driver circuit;



wherein said communication circuit extracts a command from a modulated signal and provides said command to said processor for execution of said command by said model train.

5            77.    The model train of claim 76 further comprising a coupler drive circuit and a light driver circuit.

78.    The model train of claims 76 or 77 wherein said modulated signal is a spread spectrum signal.

10            79.    A model train comprising a processor, a smoke system driver circuit coupled to said processor, and a smoke unit coupled to said smoke system driver circuit, wherein said processor controls said smoke system driver circuit so that said smoke unit outputs a volume of smoke based on the model train's speed.

15            80.    The model train of claim 79, wherein said the volume of outputted smoke changes when the model train's load changes.

20            81.    The model train of claim 79 further comprising a sound system circuit coupled to said processor, wherein said processor controls said sound system circuit so that the sound system circuit outputs sounds based on the model train's speed.

82. The model train of claim 81, wherein the outputted sounds change when the model train's load changes.

83. The model train of claim 82, wherein the volume of outputted smoke changes when the model train's load changes.

84. The model train of claim 83, wherein the outputted sound is a chuff sound and the smoke is outputted in puffs.

85. The model train of claim 84, wherein the chuff sounds and the puffs of smoke correspond to the speed of the train.

86. The model train of claim 85, wherein as the model train's load changes, there is a corresponding change in the chuff sounds and the puffs of smoke.

87. A model train comprising a processor, a sound system circuit coupled to said processor, and a speed sensing circuit coupled to said processor, wherein the processor controls the sound system circuit to output sounds based on a signal received from the speed sensing circuit indicating the model train's speed.

88. The model train of claim 87, wherein the model train's speed drops rapidly and the processor controls the sound system circuit to output a braking sound.

89. The model train of claim 87, wherein the model train's speed drops abruptly and the processor controls the sound system circuit to output a crashing sound.

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90. A model train system comprising:

5 a remote control unit;  
a track interface unit that receives commands from said remote control unit;  
a train track layout coupled to said track interface unit; and  
a model train operating on said train track layout, the model train capable  
10 of performing the commands from the remote control unit;

whereby the track interface unit saves a series of commands entered on the remote control unit such that the series of commands may be repeated at a later time.

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91. The model train system of claim 90, wherein the series of commands  
15 saved by the track interface unit is recalled by a recall command from the remote control unit.

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